



## EFFECT OF SOWING METHODS, CUTTING AGE AND GRAZING ABILITY ON GROWTH COMPONENTS AND QUALITY OF *Merremia tridentata* IN SEMI-ARID BORNO STATE

<sup>1</sup>Girgiri, A. Y., <sup>1</sup>Modu-Kagu, H. A., <sup>1</sup>Abdulazeez, H.,  
<sup>2</sup>Mustapha, U. M. and <sup>1</sup>Mohammed, H.

<sup>1</sup>Department of Animal Science, Faculty of Agriculture, University of Maiduguri.

<sup>2</sup>Mohamet Lawan College of Agriculture, Maiduguri.

**Corresponding Author:** Email: baanayi@gmail.com Phone No: 08028378092

### ABSTRACT

The study was carried out to determine the effect of sowing method, cutting age and grazing ability on growth components and quality of *Merremia tridentata* in semi-arid region of Borno State. The treatments three different sowing methods (drilling, dribbling and broadcasting), these were laid out in a completely randomized design (CRD) and replicated three times. Data were collected on Plant height, Leaf number, Leaf width and leaf length per at 4, 6, 8 weeks after sowing and 2 weeks regrowth after grazing. The result of the study showed that, sowing methods have no significant ( $P < 0.05$ ) influence on growth components at 4 weeks after sowing. At 6 weeks after sowing plant height and leaf number were significantly ( $P < 0.05$ ) influenced with values ranging from 24.92 – 33.05 cm and 46.44 – 58.11 cm, respectively with broadcasting method having the highest values. At 8 weeks after sowing all growth components were significantly ( $P < 0.05$ ) affected. Plant height and leaf length at 2 weeks after grazing were significantly ( $P < 0.05$ )( $p < 0.05$ ) different influenced by sowing method with the highest values of 30.28 and 4.37 cm, respectively recorded under broadcasting. Proximate composition of *Merremia tridentata* shows that dry matter, crude fibre, ether extract and ash values were not significantly ( $P < 0.05$ ) affected. However, crude protein and nitrogen free extract were significantly ( $P < 0.05$ ) different with values ranging from 12.82 to 14.82 % and 59.78 to 64.20 %, respectively. Based on the result of this findings, it is concluded that growth of *Merremia tridentata* is improved by using broadcasting method as it recorded the highest growth component value, high nutritive value and the ability to withstand grazing by sheep.

**Keywords:** Forbs, *Merremia tridentata*, growth components, sowing method

### INTRODUCTION

The attainment of sustainable ruminant production depends largely on availability and nutrient content of feeds. But due to uncertainty or fluctuation of rainfall and unfavourable climate in the semi-arid part of Nigeria particularly Borno state, there is a serious problem in the livestock industry which calls for intervention from stakeholders (Munzaet *et al.*, 2022). The choice of suitable sowing method plays an important role in the placement of seed at the proper depth, which ensures better emergence and subsequent crop growth. According to Gul *et al.* (2015), planting technique not only ensures proper adjustment and optimum plant population in the field but also enables the plants to utilize the land and other input resources more efficiently and resolutely towards growth and development. Moreover, several forb species are known to grow in the wild, and now that some have started gaining attention for use as livestock feed it is important to know the best sowing method to be used in planting them.

Forbs are non-grass like, non-woody, flowering herbaceous plants and are commonly called weeds. However, they are almost exclusively used for forages (as hay, silage, green chop or pasture). Forbs are important nutritive dietary components of several browses as components



of mixed pastures and have been reported to contain higher levels of phosphorus and crude protein, and lower fiber levels than shrubs or grasses (Siebert and Oreber, 2019). The genus *Merremia*, commonly referred to as wood roses, morning glory, Arrow leaf, yinbururu in Hausa, is distributed in tropical and sub-tropical regions all over the world (SowndhararaJan and Chin 2014). *Merremia* species are mostly herbaceous forbs with a generally twining or prostrate, but rarely erect growth form, is very common during the rainy season and has high acceptability by animals. The objective of this study is to determine the effect of sowing methods on the plant growth components, chemical composition at different growing periods and forage ability to withstand grazing of *Merremia tridentata*.

## **MATERIALS AND METHOD**

### **Experimental Site and Location**

The experiment was carried out at Teaching and Research Pasture Farm of the Animal Science Department, University of Maiduguri located between latitude 11°5'N 12° North, longitude 13°05' and 14° East and at altitude of 354m above sea level (Encarta, 2007). The average temperature of Maiduguri ranges from 20°C during cold dry season to 44°C during hot dry season and annual rainfall is between 400-600mm. Maiduguri has two seasons; dry and rainy and extends over a growing season to between 100-180 days. Annual rainfall varies from year to year with decreasing trends (Babu *et al.*, 2009).

### **Instrumentation**

The instrument used include lines, tag (wooden), measuring tape, pegs, spade, rake, hoe, watering can, buckets and record book.

### **Source of Experimental Materials and sources**

The materials used for the experiment include lines, tag (wooden), measuring tape, pegs, spade, rake, hoe, watering can, buckets and record book. Seeds of *Merremia tridentata* (Arrow leaf) was obtained from nearby roadsides within the University of Maiduguri premises.

### **Treatments and Experimental Design**

Land area measuring 8m x 10m (80m<sup>2</sup>) was used for the study. Land was prepared manually using hand hoeing. Nine plots each (4m x 4m) separated by 50m x 50m between and rows were made. Seeds of *Merremia tridentata* (Arrow leaf) was obtained towards the end of the rainy season and sown by direct seeding (manually) at the rate of 3kg/ha<sup>-1</sup> at a spacing (inter and intra row) 100cm for drilling in line, 50cm x 50cm apart, two seeds per hole for dibbling at 1cm depth and evenly spread after raking for broadcasting methods and covered with soil. Weeding commenced at two weeks after planting and every two weeks thereafter manually using hand picking throughout the study period. Plant establishment and other growth parameters were carried out at 4, 6 and 8 weeks after sowing then 2 and 4 weeks of regrowth, collecting and measuring parameters in dibbling (50cm apart with two middle rows), for drilling a random distance of 50cm was used while for broadcasting, stands counts was established by using a quadrant at random points. Animal were introduced after week 8 and the regrowth parameters were taken. Irrigation frequency was maintained at same rate of watering every day until establishment and then watering at two days interval.

### **Data Collection**

Data were collected at bi-weekly interval starting from 4 WAS on (plant height (cm), leaf length (cm), leaf number and leaf width (cm) then 2 and 4 weeks after grazing. The plant height was measured from the base of plant where the last leaf of the stem emerges with the aid of measure tape on three (3) randomly selected and tagged stands per plot and the mean height were determine at 4, 6, 8, 10 and 14 weeks after sowing. The leaf length was measured from the tip of the leaf to the base of the ligule with the aid of measuring tape from three (3)



randomly selected and tagged plants per plot. The numbers of leaves on the 3 randomly selected and tagged plants per plot were counted and the leaf width was determined by measuring the width way or midpoint of the leaf length for the 3 selected and tagged plants per plot.

#### **Chemical Analysis**

Dried samples of the forages were ground with the aid of mortar and pestle and allowed to pass through 2mm sieve and used for Proximate composition analysis (DM, CP, CF, EE and ash) following procedure described by AOAC (2005) while NFE was calculated as  $NFE = 100 - (\%CP + \%CF + \%EE + \%ash)$ .

#### **Statistical Analysis**

Data collected were subjected to analysis of variance (ANOVA) using the Statistical Package (Statistix10.0). Significant differences between means were separated using Least Significant Differences (LSD).

### **RESULTS AND DISCUSSION**

#### **Effect of Sowing and Cutting Age on Growth Components**

The result on the effect of sowing method on growth components at different cutting age is presented in Table 1. The result showed an increase in growth components as the weeks after planting increases. The growth components (plant height, leaf number, leaf width and leaf length) at four (4) weeks after sowing (WAS) were not significant ( $P < 0.05$ ) different between the treatments. This shows that sowing methods at 4 WAS does not affect growth components. The study agrees with the report of Rameshkumar *et al.* (2013) who also reported that planting method had no significant ( $P < 0.05$ ) effect on growth components. At six (6) weeks after sowing, there is a significant ( $P < 0.05$ ) differences in plant height and leaf number. Broadcasting method recorded the highest value of 33.05 and 58.11 for plant height and leaf number, respectively while the lowest values of 24.92 cm (plant height) and 46.44 cm (leaf number) were recorded for drilling method. These findings were not in line with Rameshkumar *et al.* (2013) who observed no significant ( $P < 0.05$ ) differences at 6 WAS. The values for leaf width and leaf length ranges from 3.30 - 3.34 and 4.07 - 4.18 cm respectively for the different treatments and were not significantly ( $P < 0.05$ ) different. These agrees with the study reported by Rivera *et al.* (2015) who also observed a non-significant ( $p > 0.05$ ) difference. The growth components at eight (8) weeks after sowing were significantly ( $P < 0.05$ ) affected by the sowing method. The values for plant height range from 42.33 - 79.77 cm, leaf number 67.55 - 116.44 cm, leaf width 3.50 - 4.58 cm and leaf length 4.46 - 5.31 cm. However, Malami and Suleiman (2007) earlier reported significant ( $P < 0.05$ ) difference in leaf number and leaf length at 4, 6, 8 and 10 and a non-significant ( $P > 0.05$ ) response in plant height and leaf width at 2, 4, 6, 8 and 10 WAS by *Lablab purpureus* to planting methods. This shows that broadcasting method has the highest values (79.77, 116.44, 4.88 and 5.31 cm) in all the growth components measured and might be attributed to space in the broadcasting method of sowing plant.

**Table 1:** Effects of sowing methods and cutting age (4, 6 and 8 WAS) on growth components

Treatments	Plant height (cm)	Leaf number (cm)	Leaf width (cm)	Leaf length (cm)
<b>4 weeks</b>				
Drilling	6.16	33.22	3.28	4.23
Dibbling	6.47	22.55	3.11	4.23
Broadcasting	6.18	13.66	2.88	3.77
SEM	0.61 <sup>NS</sup>	6.00 <sup>NS</sup>	0.34 <sup>NS</sup>	0.34 <sup>NS</sup>
<b>6 weeks</b>				
Drilling	24.92 <sup>a</sup>	46.44 <sup>a</sup>	3.32	4.15
Dibbling	30.76 <sup>ab</sup>	54.44 <sup>ab</sup>	3.34	4.18
Broadcasting	33.05 <sup>a</sup>	58.11 <sup>a</sup>	3.30	4.07
SEM	3.56 <sup>*</sup>	5.12 <sup>*</sup>	0.11 <sup>NS</sup>	0.13 <sup>NS</sup>
<b>8 weeks</b>				
Drilling	42.33 <sup>b</sup>	67.55 <sup>b</sup>	3.50 <sup>b</sup>	4.46 <sup>b</sup>
Dibbling	64.46 <sup>a</sup>	78.56 <sup>b</sup>	3.56 <sup>b</sup>	4.55 <sup>b</sup>
Broadcasting	79.77 <sup>a</sup>	116.44 <sup>a</sup>	4.58 <sup>a</sup>	5.31 <sup>a</sup>
SEM	7.43 <sup>*</sup>	12.23 <sup>*</sup>	0.17 <sup>*</sup>	0.21 <sup>*</sup>

Key: \* = significant ( $p < 0.05$ ), NS= not significant SEM = standard error of mean. Means followed the same letter in a column are statistically similar.

Table 2 shows the result of the effect of grazing on growth components after regrowth. The result showed that there is no significant ( $p > 0.05$ ) differences between the treatments used (drilling, dibbling and broadcasting) on growth component after regrowth. The result of this study is in line with that of Pavithra *et al.*, (2010) who also reported non-significant ( $p > 0.05$ ) differences response of regrowth to planting methods. At two weeks after regrowth the result showed that there is a significant ( $p < 0.05$ ) difference recorded at plant height and leaf length with both having a higher value on broadcasting method of seed planting. However, a non-significant ( $p > 0.05$ ) difference was observed on the parameters of leaf number and leaf width. The values for plant height ranged from 20.52cm (drilling method) to 30.28 cm (broadcasting method). While that of leaf length ranged from 3.93 cm (drilling) to 4.37 cm (broadcasting). The result was not in line with the study of (Kamalutheen et al., 2009) who observed a significant difference on all growth components after regrowth.

**Table 2:** Effects of grazing on growth component

Treatments	Plant height (cm)	Leaf number (cm)	Leaf width (cm)	Leaf length (cm)
Drilling	15.03	36.66	1.41	2.76
Dibbling	20.25	30.87	1.26	2.63
Broadcasting	20.25	31.33	1.33	2.96
SEM	3.50 <sup>NS</sup>	6.83 <sup>NS</sup>	0.13 <sup>NS</sup>	0.16 <sup>NS</sup>
Parameters of regrowth at 2 weeks after grazing				
Drilling	20.52 <sup>b</sup>	48.55 <sup>a</sup>	2.25 <sup>a</sup>	3.93 <sup>b</sup>
Dibbling	27.58 <sup>ab</sup>	46.44 <sup>a</sup>	2.32 <sup>a</sup>	3.98 <sup>ab</sup>
Broadcasting	30.28 <sup>a</sup>	42.50 <sup>a</sup>	2.41 <sup>a</sup>	4.37 <sup>a</sup>
SEM	3.72 <sup>*</sup>	7.04 <sup>NS</sup>	0.11 <sup>NS</sup>	0.18 <sup>*</sup>

Key: \* = significant ( $p < 0.05$ ), NS= not significant SEM = standard error of mean. Means followed the same letter in a column are statistically similar.





### Effect of Sowing Method on the Proximate Composition of *Merremia tridentata*

The proximate composition of *Merremia tridentata* using different sowing methods is shown in Table 3. No significant differences were observed in dry matter, crude fibre, ether extract and ash contents. Crude protein and nitrogen free extract content were significantly ( $P<0.05$ ) affected by the treatments. The crude protein content ranges from 12.82 to 14.82% with the lowest value in dribbling method and the highest value recorded in broadcasting method. Aschfalk *et al.* (2002) reported crude protein value of 15.3%. The ether extract value ranges from (1.45 – 2.22%), crude fiber (14.06-14.97%) and ash (3.19-8.30%) which recorded no significant ( $p>0.05$ ) differences. ( $P<0.05$ ) influence of the treatment. This study agrees with the findings of Thet *et al.*, (2020) who reported a non-significant ( $P<0.05$ ) effect of planting method at with a range of (1.05-2.25%) ether extract, (14.02-15.55%) crude fibre and (4.58-8.05%) ash, respectively. Nitrogen free extract was significantly ( $P<0.05$ ) influenced by the sowing methods with a range of 59.78-64.20%. Drilling method (64.20%) recorded the highest value followed by dribbling (62.44%) and the lowest (59.78%) in broadcasting. This is in line with the findings of (Awang-jamil *et al.*, (2021) who reported similar NFE value range of (60.02 - 65.85%).

**Table 3:** Chemical composition of *Merremia tridentata* (%)

Treatments	DM	Moisture	CP	CF	EE	Ash	NFE
Drilling	90.83	9.16a	13.09ab	14.06	1.45	7.07	64.20a
Dribbling	92.15	7.84b	12.82b	14.46	1.96	8.30	62.44ab
Broadcasting	92.70	8.30ab	14.82a	14.97	2.22	3.19	59.78b
SEM	0.98 <sup>NS</sup>	0.24*	0.73*	0.64 <sup>NS</sup>	0.37 <sup>NS</sup>	0.27 <sup>NS</sup>	1.10*

Key: \* = significant ( $p<0.05$ ), NS= not significant SEM = standard error of mean. Means followed the same letter in a column are statistically similar.

### CONCLUSION AND RECOMMENDATION

In conclusion however, the growth and nutritive value of *Merremia tridentata* improved through broadcasting method of sowing as it recorded the highest growth component value, high nutritive value and the ability to withstand grazing by recording higher plant height and leaf length after grazing by sheep. Based on the result of this findings, it is recommended that *Merremia tridentata* be grown under broadcasting sowing method for quality forage and grazing by sheep under irrigation during the dry season.

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